

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-317033

(43)Date of publication of application : 31.10.2002

(51)Int.Cl.

C08G 61/00

C09K 11/06

H05B 33/14

H05B 33/22

(21)Application number : 2001-121199

(71)Applicant : FUJI PHOTO FILM CO LTD

(22)Date of filing : 19.04.2001

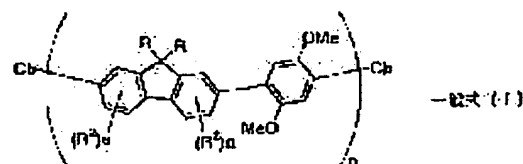
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(54) NEW POLYMER, LIGHT-EMITTING ELEMENT MATERIAL, AND LIGHT- EMITTING ELEMENT UTILIZING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a polymer having high carrier injecting properties, transportability, emission luminance, luminous efficiency and color purity in an electroluminescent element.

SOLUTION: The new polymer is represented by formula (I) (wherein, R denotes a ≥ 7 C alkyl group; (n) denotes a number of ≥ 5 ; R2 denotes a substituent group; a's denote each independently a number of 0-3; and Cb denotes an aromatic hydrocarbon group).



LEGAL STATUS

[Date of request for examination]

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[Kind of final disposal of application other than the
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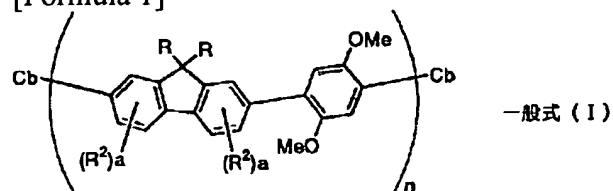
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CLAIMS

[Claim(s)]

[Claim 1] The polymer expressed with the following general formula (I).

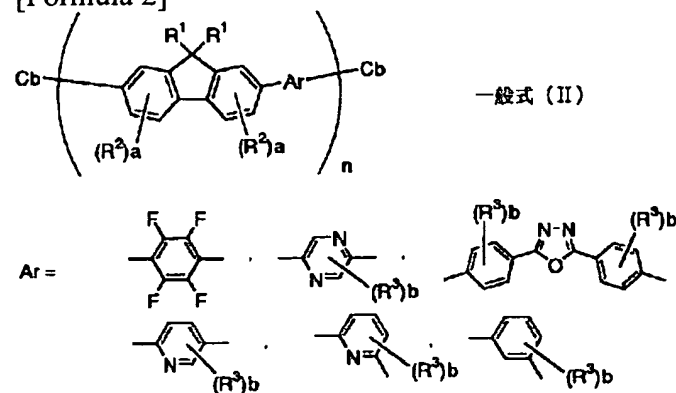
[Formula 1]



the inside of a general formula (I), and R -- a with an or more 7 carbon number [or less 20] alkyl group -- in n, R₂ expresses a substituent and a expresses the numbers from 0 to 3 for five or more numbers independently. Cb expresses an aromatic hydrocarbon radical.

[Claim 2] The polymer expressed with the following general formula (II).

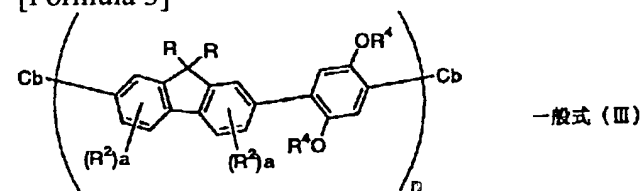
[Formula 2]



(Among a formula, in n, R₁, R₂, and R₃ express a substituent, and a expresses the numbers from 0 to 3 for five or more numbers independently respectively.) b expresses the numbers from 0 to 2 independently. Ar expresses the above-mentioned radical. Cb expresses an aromatic hydrocarbon radical.

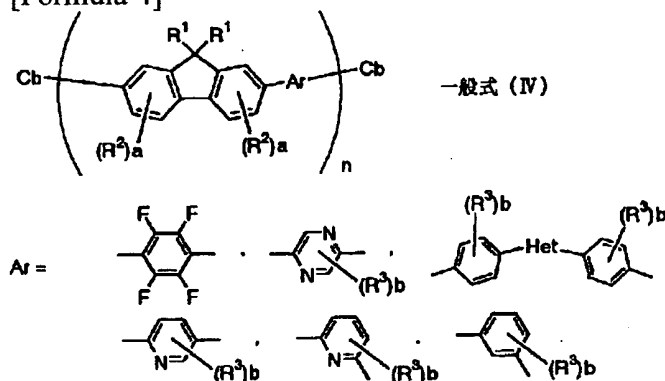
[Claim 3] The light emitting device ingredient characterized by being the polymer expressed with the following general formula (III) or (IV).

[Formula 3]



the inside of a general formula (III), and R -- a with an or more 7 carbon number [or less 20] alkyl group -- R2 -- a substituent -- in R4, n expresses five or more numbers and a expresses the numbers from 0 to 3 for an alkyl group independently. Cb expresses an aromatic hydrocarbon radical.

[Formula 4]



(n expresses five or more numbers among a general formula (IV), and a expresses the numbers from 0 to 3 independently.) R1, R2, and R3 express a substituent respectively. b expresses the numbers from 0 to 2 independently. Ar expresses the above-mentioned radical. Cb expresses an aromatic hydrocarbon radical. Het expresses a hetero aromatic series ring.

[Claim 4] The light emitting device characterized by containing the polymer by which at least one layer is expressed with a general formula (III) or (IV) according to claim 3 in the light emitting device in which two or more organic compound layers which contain a luminous layer or a luminous layer in inter-electrode [of a pair] were formed.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to the light emitting device which can use the polymer and the charge of semiconductor device material which have high carrier impregnation nature and carrier transportability, the semiconductor device using it, and electrical energy about the charge of organic electroluminescence-devices (light emitting device is called hereafter) material and light emitting device which change into light and can emit light suitable for fields, such as an electronic circuitry, a transistor and a display device, a display, a back light, electrophotography, the source of the illumination light, the record light source, the reading light source an indicator, a signboard, an interior, an optical-communication device,.

[0002]

[Description of the Prior Art] The researches and developments about various display devices are active, and especially, since a light emitting device can obtain luminescence of the high brightness in a low battery, it attracts attention as a promising display device today. For example, the light emitting device (laminating mold component) (applied physics Letters, 51 volumes, 913 pages, 1987) to which the laminating of the organic thin film was carried out by vacuum evaporation of an organic compound, and the polymer system component (Nature, Vol.356, 5 March 1992, 47th term) are known.

[0003] Since creation of the spreading mold component by the polymer system ingredient has the simple manufacture process especially, examination of former versatility has been made. for example, the component to which the polymerization method of the poly fluorene copolymer used the poly fluorene copolymer and this for an United States patent, No. 5,777,070, etc. -- WO 97/No. 33323 -- said -- No. 97/05184 -- said -- No. 99/48160 -- said -- No. 99/54385 and applied one Physics The fall of the further driver voltage, improvement in carrier mobility, and improvement in luminous efficiency were but desired as indicated in Letters, 75 volumes, 3270 pages, 1999, etc. Moreover, when polymer system luminescent material was used, there was a case where the problem that an excimer is formed of the interaction between polymer chains, and luminescence wavelength long-wave-izes from a solution condition arose by a drive immediately after component creation or the passage of time.

[0004] Moreover, also in endurance, at the case where it drives after the long duration passage of time, or the time of a continuation drive, that the fall of brightness tends to occur etc. has a problem, and the polymer system component had many problems for them for presenting practical use at them.

[0005]

[Problem(s) to be Solved by the Invention] The purpose of this invention is in offer of the new light emitting device which has a low-battery drive, high brightness, and the property of high luminous efficiency in order to solve the above-mentioned problem at the time of using a production process, workability, and a polymer system ingredient advantageous to large-area-izing, and has elevated-temperature preservation endurance. Moreover, as an electron device ingredient, a hole or an electron is poured in and conveyed with high mobility, and it is in film creation offering a simple ingredient.

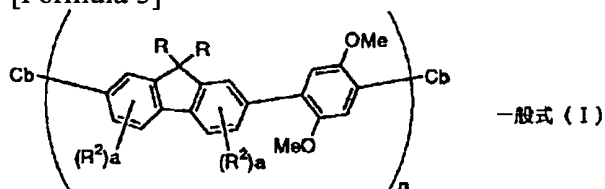
[0006]

[Means for Solving the Problem] The above-mentioned technical problem was attained by the means of following this invention.

(1) The polymer expressed with the following general formula (I).

[0007]

[Formula 5]

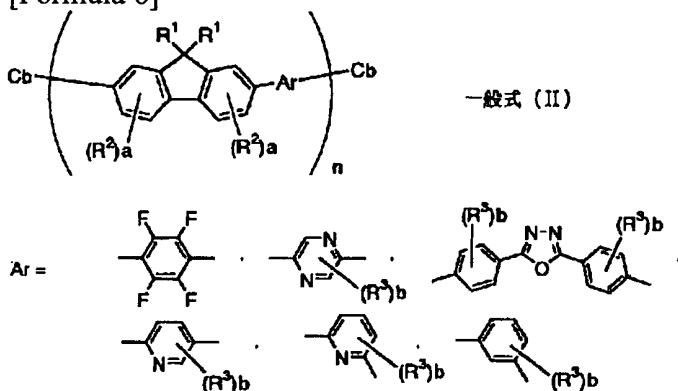


[0008] the inside of a general formula (I), and R -- a with a carbon numbers of seven or more alkyl group -- in n, R₂ expresses a substituent and a expresses the numbers from 0 to 3 for five or more numbers independently. Cb expresses an aromatic hydrocarbon radical.

(2) The polymer expressed with the following general formula (II).

[0009]

[Formula 6]

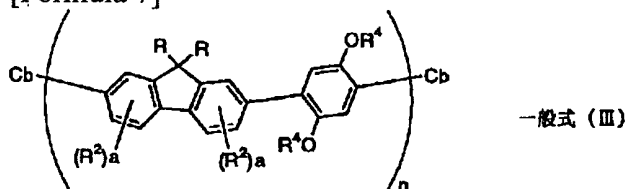


[0010] (Among a formula, in n, R₁, R₂, and R₃ express a substituent, and a expresses the numbers from 0 to 3 for five or more numbers independently respectively.) b expresses the numbers from 0 to 2 independently. Ar expresses the above-mentioned radical. Cb expresses an aromatic hydrocarbon radical.

(3) The light emitting device ingredient characterized by being the polymer expressed with the following general formula (III) or (IV).

[0011]

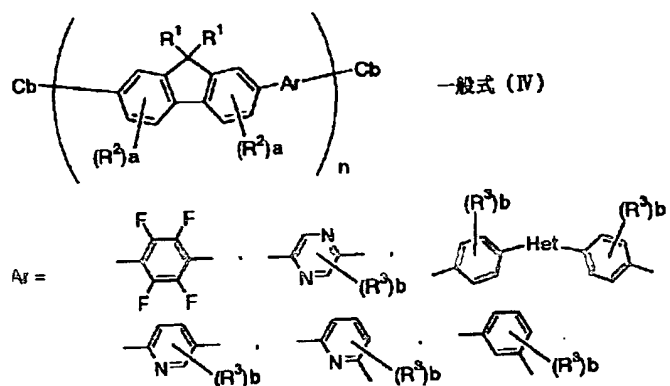
[Formula 7]



[0012] the inside of a general formula (III), and R -- a with a carbon numbers of seven or more alkyl group -- R₂ -- a substituent -- in R₄, n expresses five or more numbers and a expresses the numbers from 0 to 3 for an alkyl group independently. Cb expresses an aromatic hydrocarbon radical.

[0013]

[Formula 8]



[0014] (n expresses five or more numbers among a general formula (IV), and a expresses the numbers from 0 to 3 independently.) R1, R2, and R3 express a substituent respectively. b expresses the numbers from 0 to 2 independently. Ar expresses the above-mentioned radical. Cb expresses an aromatic hydrocarbon radical. Het expresses a hetero aromatic series ring.

(4) The light emitting device characterized by containing the light emitting device ingredient of a publication in (3) further at least in the light emitting device in which two or more organic compound layers which contain a luminous layer or a luminous layer in inter-electrode [of a pair] were formed.

[0015]
[Embodiment of the Invention] Hereafter, this invention is explained to a detail. In addition, in this specification, "-" shows the range which includes the numeric value indicated before and behind that as the minimum value and maximum, respectively.

[0016] As mentioned above, in order to develop the ingredient which has a low-battery drive, high brightness, and the property of high luminous efficiency, and has elevated-temperature preservation endurance, this invention person came to develop the poly fluorene copolymer which has a copolymerization component as shown in the above-mentioned general formula (I) - (IV), as a result of repeating examination wholeheartedly. The component which used the poly fluorene copolymer, its polymerization method, and this an above-mentioned United States patent, No. 5,777,070, and WO 97/No. 33323 -- said -- No. 97/05184 -- said -- No. 99/48160 -- said -- No. 99/54385 and applied ones Physics But as already reported in Letters, 75 volumes, 3270 pages, 1999, etc. The poly fluorene copolymer which has a copolymerization component as shown in the above (1) and (2) was not reported at all until now. Moreover, applied physics Although the analogue of this invention which has 2 and 5-JIDESHIRU oxy-radical is reported in Letters, 75 volumes, 3270 pages, and 1999 and the device of various lamination was examined, luminescence wavelength was still as long as the luminescence wavelength of 420nm in a film and 448nm, and the half-value width of 69nm, and driver voltage was low brightness highly also by the component engine performance.

[0017] Next, the compound of the general formula (I) of this invention is explained to a detail. Among a formula, as R, independently, the alkyl group to carbon numbers 7-20 may be desirable, may combine with 9 place carbon atom of a fluorene ring, and may form the ring structure of carbon numbers 7-20, respectively. As R, the alkyl group to carbon numbers 8-16 is more desirable, and especially normal octyl radical, 2-ethylhexyl radical, normal decyl group, normal dodecyl, and normal hexadecyl radical ** is desirable.

[0018] As R2, independently, respectively The alkyl group to carbon numbers 1-20, The alkyloxy radical to carbon numbers 1-20, the thioether radical to carbon numbers 1-20, The alkylcarbonyloxy radical or cyano group to carbon numbers 1-20 is desirable. The alkyl group to carbon numbers 1-16, the alkyloxy radical to carbon numbers 1-16, The thioether radical to carbon numbers 1-16, the alkylcarbonyloxy radical to carbon numbers 1-16, or a cyano group is more desirable. A methyl group, an ethyl group, a normal propyl group, an isopropyl group, normal butyl, An isobutyl radical, tertiary butyl, a normal hexyl group, a normal octyl radical, A 2-ethylhexyl radical, the normal dodecyl, a normal hexadecyl radical, A methoxy group, an ethoxy radical, a normal propyloxy radical, an isopropyloxy radical, A normal butyloxy radical, an isobutyloxy radical, a normal hexyloxy radical, A normal octyloxy radical, 2-ethylhexyloxy radical, a normal dodecyloxy radical, A normal hexadecyl oxy-radical, a methylthio radical, an ethyl thio radical, a normal propyl thio radical, An isopropyl thio radical, a normal butyl thio radical, an isobutyl thio radical,

a normal hexyl thio radical, A normal octylthio radical, a 2-ethylhexyl thio radical, a normal dodecyl thio radical, A normal hexadecyl thio radical, methyl carbonyloxy group, ethyl carbonyloxy group, Normal propyl carbonyloxy group, isopropyl carbonyloxy group, Normal butyl carbonyloxy group, isobutyl carbonyloxy group, Normal hexyl carbonyloxy group, normal octyl carbonyloxy group, 2-ethylhexyl carbonyloxy group, normal dodecyl carbonyloxy group, normal hexadecyl carbonyloxy group, and especially a cyano group are desirable.

[0019] As polymerization degree n of a polymer, 5-100000 are desirable, 10-100000 are more desirable, and 20-especially 100000 are desirable.

[0020] As a , 0-2 are desirable, 0-1 are more desirable, and especially 0 is desirable.

[0021] As a substituent in which the benzene ring, a naphthalene ring, and a phenanthrene ring may be desirable as Cb, and rings, such as this, may have the substituent further An alkyl group, an aryl group, an alkoxy group, an aryloxy group, an aralkyloxy radical, An alkylthio group, a nitro group, a trifluoromethyl radical, a carboxyl group, A formyl group, an alkoxy carbonyl group, an acyl group, an alkenyl radical, and a dialkylamino radical are desirable. A methyl group, an ethyl group, a normal propyl group, an isopropyl group, normal butyl, Tertiary butyl, a cyclo propyl group, a phenyl group, a methoxy group, An ethoxy radical, a normal propoxy group, an isopropoxy group, a phenyloxy radical, A benzyloxy radical, a methylthio radical, an ethyl thio radical, a normal propyl thio radical, An isopropyl thio radical, a normal butyl thio radical, a nitro group, a trifluoromethyl radical, A carboxyl group, a formyl group, a methoxycarbonyl group, an ethoxycarbonyl radical, A normal propoxy carbonyl group, an isopropoxycarbonyl radical, a methyl carbonyl group, An ethyl carbonyl group, a normal propylcarbonyl radical, an isopropyl carbonyl group, A normal butyl carbonyl group, a vinyl group, and a dimethylamino radical are more desirable. A methyl group, an ethyl group, a normal propyl group, tertiary butyl, A cyclo propyl group, a phenyl group, a methoxy group, an ethoxy radical, a phenyloxy radical, A benzyloxy radical, a methylthio radical, a nitro group, a trifluoromethyl radical, a carboxyl group, a formyl group, a methoxycarbonyl group, an ethoxycarbonyl radical, a methyl carbonyl group, a vinyl group, and especially a dimethylamino radical are desirable.

[0022] Next, the compound of the general formula (II) of this invention is explained to a detail. As R1, independently, respectively The alkyl group to carbon numbers 1-20, The alkyl group to the carbon numbers 1-20 containing one or more sulfur atoms, nitrogen atoms, oxygen atoms, or silicon atoms, The alkylcarbonyloxy radical to carbon numbers 4-16 and the aryl group to carbon numbers 6-16 are desirable. It is the thing of the ring structure of the carbon numbers 4-20 containing the ring structure or the sulfur atom, nitrogen atom, or oxygen atom of carbon numbers 5-20 preferably as a ring of a fluorene ring which may combine with a carbon atom the 9th place, may form a ring, and is formed. As R1, the alkyl group to carbon numbers 1-16, the polyalkylene oxy-radical to carbon numbers 1-16, The alkylcarbonyloxy radical to carbon numbers 4-8 and the aryl group to carbon numbers 6-14 are more desirable. The alkyl group to carbon numbers 8-16 is still more desirable. A methyl group, an ethyl group, A normal propyl group, an isopropyl group, normal butyl, an isobutyl radical, A normal hexyl group, a normal octyl radical, a 2-ethylhexyl radical, The normal dodecyl, a normal hexadecyl radical, a methoxy ethoxyethyl radical, An ethoxy ethoxyethyl radical, methyl carbonyloxy group, ethyl carbonyloxy group, Normal propyl carbonyloxy group, isopropyl carbonyloxy group, Normal butyl carbonyloxy group, isobutyl carbonyloxy group, Normal hexyl carbonyloxy group, a phenyl group, a naphthyl group, and an anthryl radical are still more desirable, and a normal hexyl group, a normal octyl radical, a 2-ethylhexyl radical, the normal dodecyl, and especially a normal hexadecyl radical are desirable.

[0023] The radical same as R2, a , and n is chosen as respectively desirable range as the general formula (I) described.

[0024] As R3, an alkyl group, an aryl group, an alkoxy group, an aryloxy group, An aralkyloxy radical, an alkylthio group, a nitro group, a trifluoromethyl radical, A dialkylamino radical is desirable. A methyl group, an ethyl group, a normal propyl group, An isopropyl group, normal butyl, tertiary butyl, a cyclo propyl group, A phenyl group, a methoxy group, an ethoxy radical, a normal propoxy group, an isopropoxy group, A phenyloxy radical, a benzyloxy radical, a methylthio radical, an ethyl thio radical, A normal propyl thio radical, an isopropyl thio radical, a normal butyl thio radical, A nitro group, a trifluoromethyl radical, and a dimethylamino radical are more desirable. A methyl group, an ethyl group, a normal propyl group, tertiary butyl, a cyclo propyl group, a phenyl group, a methoxy group, an ethoxy radical, a phenyloxy radical, a benzyloxy radical, a methylthio radical, a nitro group, a trifluoromethyl radical, and especially a dimethylamino radical are desirable.

[0025] As b , 0-1 are desirable and 0 is more desirable.

[0026] The radical same as Cb is chosen as desirable range as the general formula (I) described.

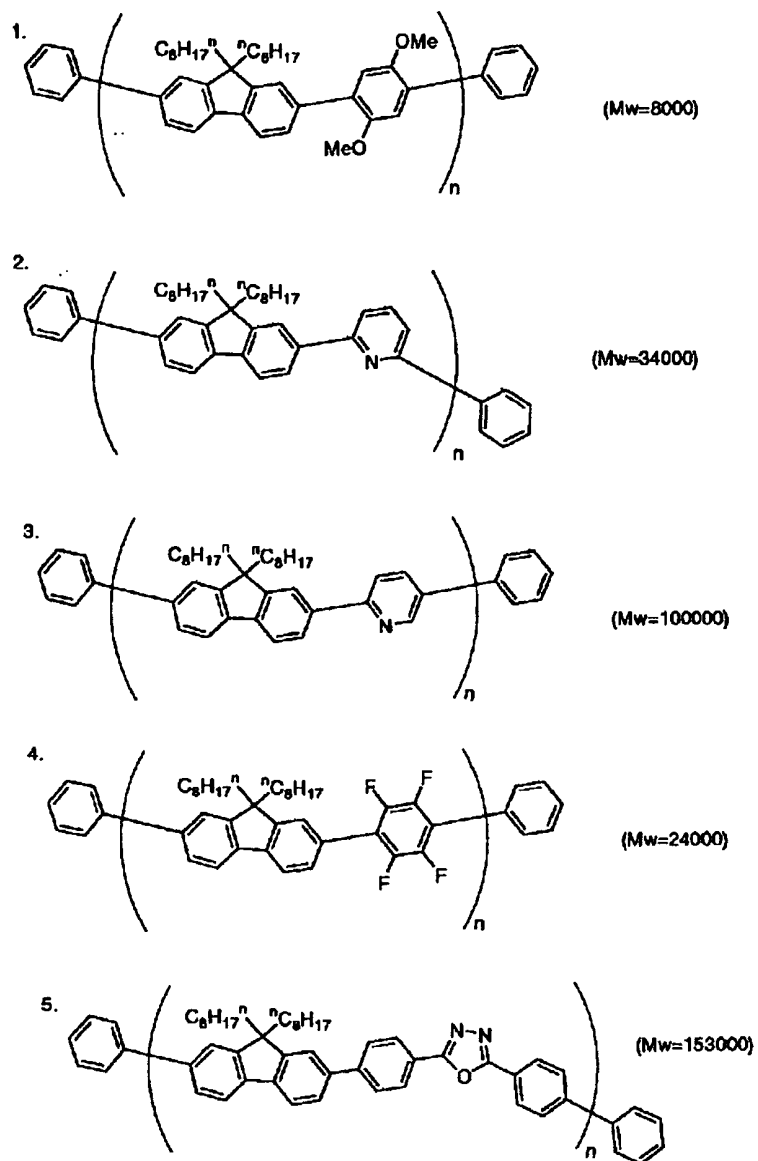
[0027] Next, the compound of the general formula (III) of this invention is explained to a detail. The radical same as R, R₂, a, and n is chosen as respectively desirable range as the general formula (I) described. As R₄, the alkyl group of carbon numbers 1-9 is desirable, the alkyl group of carbon numbers 1-6 is more desirable, and especially the alkyl group of carbon numbers 1-4 is desirable. The same radical is chosen as desirable range as the general formula (I) described as Cb.

[0028] Next, the compound of the general formula (IV) of this invention is explained to a detail. The radical same as R₁, R₂, a, n, Cb, and b is chosen as respectively desirable range as the general formula (II) described. As Het, rings, such as triazole, thiadiazole, OKISA diazole, triazine, pyrazine, a pyrimidine, a furan, a pyrrole, a thiophene, oxazole, a pyridine, benzofuran, and phenan SURORIN, are desirable, triazole, thiadiazole, OKISA diazole, triazine, a furan, a pyrrole, a thiophene, oxazole, a pyridine, phenan SURORIN, etc. are more desirable, and triazole, OKISA diazole, triazine, a pyrrole, a thiophene, oxazole, a pyridine, especially phenan SURORIN, etc. are desirable. Moreover, they may have the substituent, as a substituent, rings, such as this, have an alkyl group, an aryl group, and a desirable cyano group, a methyl group, an ethyl group, a normal propyl group, an isopropyl group, normal butyl, an isobutyl radical, tertiary butyl, a phenyl group, and its cyano group are more desirable, and a methyl group, an ethyl group, a normal propyl group, an isopropyl group, tertiary butyl, a phenyl group, and especially its cyano group are desirable.

[0029] The effective typical example of a compound is especially shown among the compounds expressed with the general formula (I) used for this invention - (IV) below.

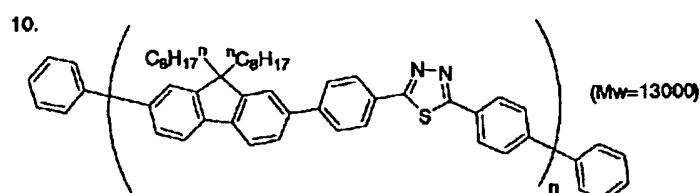
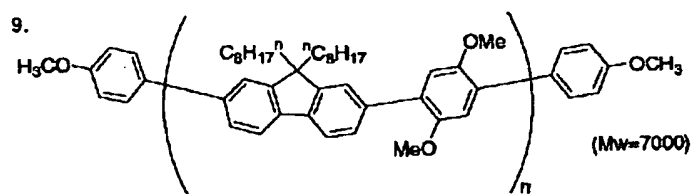
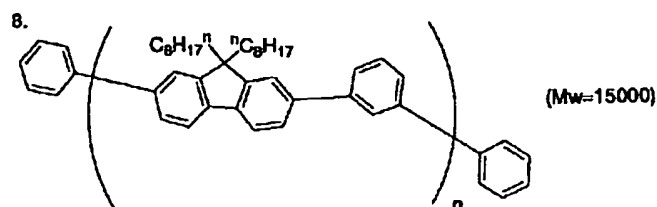
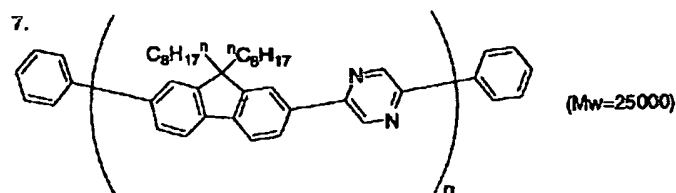
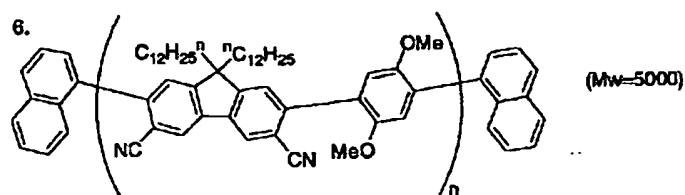
[0030]

[Formula 9]



[0031]

[Formula 10]



[0032] Next, the manufacture approach of a polymer expressed with the above-mentioned general formula (I) - (IV) is explained. The approach of a polymerization can be performed according to the approach indicated by the approach currently indicated by an United States patent, No. 5,777,070, etc., Macromolecules, 1997, 30 volumes, 7686 -7691 term, etc. When the coupling reaction of the boric acid reagent of two organic functions and an aromatic series halogenide performs a polymerization, as for the ratio of both monomers, 0.90:1.10 to 1.00:1.00 is desirable, 0.95:1.05 to 1.00:1.00 is more desirable, and especially 0.98:1.02 to 1.00:1.00 is desirable. Although what dissolves each monomer 2% or more preferably at least 1% or more, and makes a solution is desirable as for the solvent to be used and the aromatic series radical content solvent especially the benzene, the toluene, the xylene, the ethylbenzene, the mesitylene, the anisoles, or these fluorination objects to carbon numbers 6-20 are desirable more preferably, toluene is used most suitably. Although the amount of the solvent to be used is chosen so that the reaction mixture thickened by advance of a polymerization can be stirred effectively, generally its 1-100ml is desirable to monomer 1g, its 3-50ml is more desirable, and especially its 5-20ml is desirable.

[0033] As a base to be used, a water-soluble organic base is desirable, an alkali-metal carbonate and an alkali-metal hydrogencarbonate are more desirable, and potassium carbonate and especially a sodium carbonate are desirable. As underwater concentration of the base to be used, 1 - the decanormal are desirable, one to 5 convention is more desirable, and especially one to 3 convention is desirable. As an amount of the base to be used, 1-10Eq is desirable to a

halogenide monomer, 1-5Eq is more desirable, and especially 1-3Eq is desirable. As a polymerization catalyst to be used, a palladium catalyst is desirable, Pd (II) salt or zero ** palladium (Pd (0)) is more desirable, and acetic-acid palladium or especially tetrakis (triphenylphosphine) palladium is desirable. As an amount of the polymerization catalyst to be used, 1×10^{-6} to 1×10^{-1} mol is desirable to one mol of monomers, 1×10^{-5} to 1×10^{-1} mol are more desirable, and especially 1×10^{-4} to 1×10^{-1} mol are desirable.

[0034] Use of a correlation migration catalyst is very effective in order to raise the polymerization degree of a polymer. As a correlation migration catalyst to be used, ammonium salt, phosphonium salt, crown ether, chestnut PUTAN, etc. are desirable, tetra-alkylammonium halide, a tetra-alkylammonium hydrogensulfate, tetra-alkylammonium hydroxide, etc. are more desirable, and tetra-normal butyl ammonium halide, benzyl triethyl ammonium halide, especially TORIKA prill ylmethyl ammoniumchloride, etc. are desirable. As an amount of the correlation migration catalyst to be used, 0.001 mols - one mol is desirable to one mol of monomers, 0.01 mols - 0.5 mols are more desirable, and 0.05 mols - especially 0.3 mols are desirable.

[0035] Although near the boiling point of the solvent to be used is desirable as temperature of a polymerization reaction, room temperature -170 degree C is desirable, room temperature -150 degree C is more desirable, and especially room temperature -130 degree C is desirable. As polymerization time amount, 1 - 50 hours is desirable, 1 - 24 hours is more desirable, and especially 1 - 10 hours are desirable. As polymerization degree of the polymer to generate, 5-100000 are desirable, 10-100000 are more desirable, and 20-especially 100000 are desirable. As for degree of dispersion of a polymer, 1.0-10 are desirable, 1.0-7.0 are more desirable, and 1.0-especially 5.0 are desirable.

[0036] Although the purification method of the polymer which carried out the polymerization is not limited especially, either, after usually diluting a reaction solution with the solvent suitable for direct or the above-mentioned polymerization, the approach of trickling into a poor solvent and carrying out reprecipitation purification is desirable. as a poor solvent -- alcohol, water, an acetone, acetic ester, an acetonitrile, hydrocarbon system solvents, and these mixed solvents -- desirable -- ethanol, a methanol, water, an acetone, ethyl acetate, and an acetonitrile -- passing -- KISAN, heptane, and these mixed solvents -- more -- desirable -- ethanol, a methanol, water, an acetone, ethyl acetate, and an acetonitrile -- it passes and KISAN and these mixed solvents are more desirable.

[0037] Next, the light emitting device ingredient characterized by being the polymer expressed with a general formula (I) - (IV) is explained. In addition, in this invention, a light emitting device ingredient means the ingredient which bears two or more roles called luminescent compound independent a role or an electron injectional compound, an electronic transportability compound, a hole injectional compound, a hole transportability compound, and a host compound. A polymer may be a homopolymer which consists of a single component, and may be a copolymer which consists of multicomponent. Moreover, after refining the polymer which was made to carry out the polymerization of the monomer and was obtained in the specific meltable solvent as mentioned above remaining as it is or if needed, you may use it. Moreover, it is desirable that the polymer expressed with a general formula (I) - (IV) from a carrier migratory viewpoint bears an electron injectional compound, an electronic transportability compound, a hole injectional compound, a hole transportability compound, host compounds, and two or more of these roles. Although the carrier migratory degree of the polymer as the charge of light emitting device material or a charge of semiconductor device material is not limited especially, either, in the range of field strength 400-1000 (v/cm) (1/2) Electron mobility and Hall mobility have a 2-V-1-s-1 or more 1.0×10^{-4} to 8 cm desirable value, a 2-V-1-s-1 or more 1.0×10^{-4} to 7 cm value is more desirable, and especially a 2-V-1-s-1 or more 1.0×10^{-4} to 6 cm value is desirable.

[0038] next, luminescence **** which contains the polymer by which at least one layer is expressed with a general formula (I) - (IV) in the light emitting device in which two or more organic compound thin layers which contain a luminous layer or a luminous layer in inter-electrode [of a pair] were formed -- it ***** just. Although the carrier migratory degree of the polymer as the charge of light emitting device material or a charge of semiconductor device material is not limited especially, either, in the range of field strength 400-1000 (v/cm) (1/2) Electron mobility and Hall mobility have a 2-V-1-s-1 or more 1.0×10^{-4} to 8 cm desirable value, a 2-V-1-s-1 or more 1.0×10^{-4} to 7 cm value is more desirable, and especially a 2-V-1-s-1 or more 1.0×10^{-4} to 6 cm value is desirable.

[0039] The light emitting device of this invention is the configuration in which two or more organic compound thin layers containing a luminous layer or a luminous layer were formed, may have a protective layer besides a luminous layer etc. in inter-electrode [of the pair of an anode plate and cathode], and may equip it with the function of others [each class / these], respectively. Various ingredients can be used for formation of each class, respectively.

[0040] The compound with which an organic compound layer serves both as an electron injection compound, an electronic transportability compound, electron injection nature, and transportability (transportability [electron injection nature-cum-] compound), The compound which serves both as a hole injection compound, a hole transportability compound, hole impregnation nature, and hole transportability (transportability [hole impregnation nature-cum-] compound), The compound which serves as each of electron injection nature-cum-transportability, and hole impregnation nature-cum-transportability (transportability [hole / a transportability / electron injection nature-cum-/ compound-cum-/ impregnation nature-cum-] compound), Some ingredients chosen from a luminescent compound, a host compound, an electron-donative dopant, an electronic receptiveness dopant, etc. are contained and used.

[0041] The organic compound layer of this invention may consist of only high molecular compounds, and may consist of a high molecular compound and mixture of a low molecular weight compound, or whichever is sufficient as it.

[0042] The electron injection compound contained in the organic compound layer used for the light emitting device of this invention, An electronic transportability compound, a transportability [electron injection nature-cum-] compound, a hole injection compound, A hole transportability compound, a transportability [hole impregnation nature-cum-] compound, a transportability [hole / a transportability / electron injection nature-cum-/ compound-cum-/ impregnation nature-cum-] compound, The property and part which bear some functions may contain these compounds, such as a luminescent compound, a host compound, an electron-donative dopant, and an electronic receptiveness dopant, in one molecule. Moreover, each function may be divided into the separate molecule.

[0043] The rate of contribution of the electron injection nature which a transportability [hole / a transportability / electron injection nature-cum-/ compound-cum-/ impregnation nature-cum-] compound bears and transportability, hole impregnation nature, and transportability can take the value which changes with compounds.

[0044] As for the electron mobility of the organic compound layer of this invention, it is desirable to be the range of field strength 400-1000 (V/cm) (1/2), and to have a 2-V-1-s-1 or more 3×10 to 8 cm value from a viewpoint of driver voltage, its 2-V-1-s-1 or more 1×10 to 7 cm value is more desirable, and its 2-V-1-s-1 or more 5×10 to 6 cm value is still more desirable.

[0045] Electron mobility is prescribed by the amount of mixing of these compounds although the electron mobility of an organic compound layer is prescribed by the electron mobility which each compound itself which constitutes this layer of an electron injection compound, an electronic transportability compound, a transportability [electron injection nature-cum-] compound, a hole injection compound, a hole transportability compound, a transportability [hole impregnation nature-cum-] compound, and a transportability [hole / a transportability / electron injection nature-cum-/ compound-cum-/ impregnation nature-cum-] compound has. As a compound which has the value of this electron mobility, although a hetero atom content organic compound, an electronic transportability organic compound, an organic compound complex, an organometallic complex, an organometallic compound, electron donor acceptor complexes and these polymers, the conjugated-system polymer, the conductive polymer, etc. are mainly known, it will not be limited especially if the value of the above-mentioned electron mobility is fulfilled, and it can be used, choosing suitably. In the above-mentioned example, a nitrogen-containing organic compound, an oxygenated organic compound, a sulfur-containing organic compound, a boron-bearing organic compound, a silicon-containing organic compound, a phosphorus-containing organic compound, a liquid crystallinity organic compound, a crystalline organic compound, an organic compound complex, an organometallic complex, an organometallic compound, an electron donor acceptor complex, a conjugated-system polymer, etc. are desirable, and the electron donor acceptor complex of a hetero atom content aromatic series organic compound and a hetero atom content aromatic series organic compound, an organometallic compound, an electron donor acceptor complex, a liquid crystallinity organic compound, crystalline organic compounds and these polymers, a conjugated-system polymer, etc. are more desirable especially.

[0046] measurement of the electron mobility in this invention -- time OFE a flight (TOF is called hereafter) -- is measured by law. Synthetic about the TOF method Metals (Synth.Met.) 111/112 (2000) and a 331-page publication can be referred to.

[0047] The ionization potential of the compound used for the organic compound layer of this invention is decided with the compound which usually has the minimum value. As for the ionization potential of this compound, it is desirable that it is 4.7eV or more 10.0eV or less in the viewpoint of hole impregnation nature, it is more desirable that it is [4.8eV or more] 10.0eV or less, and it is still more desirable that it is [4.9eV or more] 10.0eV or less. Similarly, it is desirable that it is 5.0eV or more 10.0eV or less in the viewpoint of hole impregnation nature, it is more desirable that it

is [5.1eV or more] 10.0eV or less, and, as for the ionization potential of the arylamine derivative used for the organic compound layer of this invention, it is still more desirable that it is [5.2eV or more] 10.0eV or less.

[0048] When using the organic compound layer of this invention, the organic compound layer of this invention may be prepared on a thin film like the PEDOT-PSS film (polyethylene dioxythiophene-polystyrene sulfonate dope object) which carried out drainage system spreading. When preparing the organic compound layer of this invention, a low-molecular vacuum evaporation process is sufficient, and a spreading process is sufficient. In the case of a spreading process, as a desirable spreading solvent Water, a methanol, ethanol, Propanol, isopropanol, a butanol, formic acid, an acetic acid, methyl cellosolve, Ethylcellosolve, ethylene glycol, propylene glycol, dioxane, Benzene, toluene, a xylene, chloroform, dichloromethane, a dichloroethane, Tetrahydrofurans and these mixed solvents are desirable. Water, a methanol, Ethanol, propanol, isopropanol, an acetic acid, methyl cellosolve, ethylcellosolve, ethylene glycol, dioxane, toluene, chloroform, dichloromethane, a dichloroethane, tetrahydrofurans, and these mixed solvents are more desirable.

[0049] An anode plate can supply a hole to a hole injectional compound, a hole transportability compound, a transportability [hole impregnation nature-cum-] compound, a host compound, etc., a metal, an alloy, a metallic oxide, conductive compounds, such mixture, etc. can be used, and a work function is an ingredient 4eV or more preferably. As an example, conductive metallic oxide, such as tin oxide, a zinc oxide, indium oxide, and tin dope indium oxide (ITO), Or metals, such as gold, silver, chromium, and nickel, and mixture of these metals and conductive metallic oxide, or inorganic conductivity matter (laminated material, iodation copper, copper sulfide, etc.) and an organic conductivity ingredient (the poly aniline --) The laminated material of these and ITO(s), such as the poly thiophene and polypyrrole, etc. is mentioned. Preferably It is conductive metallic oxide, organic conductivity ingredients, or such laminated material, and a point to ITO or ITO/PEDOT-PSS laminated material, such as productivity, high conductivity, and transparency, are more desirable. Although the thickness of an anode plate is selectable suitably by the ingredient, usually the thing of the range of 10nm - 5 micrometers is desirable, and is 50nm - 1 micrometer more preferably, and it is 100nm - 500nm still more preferably.

[0050] What usually carried out the stratification of the anode plate on soda lime glass, alkali free glass, a transparence resin substrate, etc. is used. When using glass, in order to lessen the elution ion from glass, about the quality of the material, it is desirable to use alkali free glass. Moreover, when using soda lime glass, it is desirable to use what gave barrier coating sealant, such as a silica. If the thickness of a substrate is enough to maintain a mechanical strength, there will be especially no limit, but in using glass, it usually uses a thing 0.7mm or more preferably 0.2mm or more. Although various approaches are used for creation of an anode plate with an ingredient, in ITO, film formation is carried out by approaches, such as spreading of an electron beam method, the sputtering method, resistance heating vacuum deposition, chemical reaction methods (sol-gel method etc.), and an ITO distribution object, for example. By processing of washing and others, the driver voltage of a component is lowered and an anode plate can also raise luminous efficiency. For example, in ITO, UV-ozonization, plasma treatment, etc. are effective.

[0051] Cathode supplies an electron to an electron injectional compound, an electronic transportability compound, a transportability [electron injection nature-cum-] compound, a host compound, etc., and is chosen in consideration of adhesion with these compounds and matrix compounds, ionization potential, stability, etc. As an ingredient of cathode, a metal, an alloy, a metal halogenide, a metallic oxide, an electrical conductivity compound, Organic metal salts, such mixture, or laminated material can be used. As an example, alkali metal (for example, Li, Na, K, etc.) and the fluoride of those, or an oxide, Alkaline earth metal (for example, Mg, calcium, etc.) and the fluoride of those, or an oxide, Gold, silver, lead, ARUNIUMU, sodium-potassium alloys, or those mixed metals, Lithium-aluminium alloys or those mixed metals, magnesium-silver alloys, or those mixed metals, The organic compound salt of rare earth metals, such as an indium and ITTERIBIUMU, alkali metal, and alkaline earth metal etc. is mentioned. A work function is an ingredient 4eV or less preferably, and they are aluminum, lithium-aluminium alloys or those mixed metals, magnesium-silver alloys or those mixed metals, organic lithium salt, etc. more preferably.

[0052] Cathode can also take the laminated structure not only containing the monolayer structure of the above-mentioned compound and mixture but the above-mentioned compound and mixture. Although the thickness of cathode is selectable suitably by the ingredient, usually the range of 10nm - 5 micrometers is desirable, and is 50nm - 1 micrometer more preferably, and it is 100nm - 1 micrometer still more preferably. Approaches, such as an electron beam method, the sputtering method, resistance heating vacuum deposition, and a coating method, are used for

production of cathode, and vapor-depositing a metal alone can also vapor-deposit two or more components to coincidence. Moreover, the alloy which is possible also for vapor-depositing two or more metals to coincidence, and forming an alloy electrode, and was adjusted beforehand may be made to vapor-deposit. The lower one of the sheet resistance of an anode plate and cathode is desirable, and below its 15ohms / ** are desirable.

[0053] While a luminescent compound can pour in a hole from an anode plate or a hole impregnation layer, and a hole transportation layer at the time of electric-field impression, as long as it has the function to in_which an electron can be poured in from cathode or an electronic injection layer, and an electronic transportation layer, and the function, to which the poured-in charge is moved and the function offer a hole and the place of electronic recombination and make it emit light, it is good and a singlet exciton or a triplet exciton may emit light either anything. Although a conjugated-system unsaturated compound, an alt.metal-ized metal complex, or a porphyrin metal complex is mentioned preferably as a luminescent compound, other luminescent material may be used together and used. Luminescent material may use a low-molecular ingredient, using a polymer. The compound specifically listed below can be used.

[0054] (a) Benzooxazole, benzimidazole, benzothiazole, styryl benzene, polyphenyl, diphenyl butadiene, tetra-phenyl butadiene, North America Free Trade Agreement RUIMIDO, coumarin, perylene, and peri non, OKISA diazole, aldazine, a cyclopentadiene, a bis-styryl anthracene, Quinacridone, a pyrrolo pyridine, a thiadiazolo pyridine, a cyclopentadiene, a styryl amine, an aromatic dimethyldiyne compound, pyrenes, these derivatives, etc.

(b) The various metal complexes represented by an eight quinolinol, and the metal complex and rare earth complex of the derivative.

(c) (d) alt.metal-ized metal complexes, such as the poly thiophene, polyphenylene, the poly fluorene, polyphenylene vinylenes, and these permuted polymer compounds, or a porphyrin metal complex.

[0055] The compound preferably used also in said compound is as follows. Styryl benzene, polyphenyl, a diphenyl butadiene, a tetra-phenyl butadiene, A coumarin, perylene, OKISA diazole, a bis-styryl anthracene, Quinacridone, a cyclopentadiene, a styryl amine, an aromatic dimethyldiyne compound, The various metal complexes represented by; eight quinolinol, and the metal complexes and rare earth complexes of the derivative, such as pyrenes and these derivatives; The poly thiophene, Polyphenylene, the poly fluorene, polyphenylene vinylenes, these permuted polymer compounds; ;, such as an alt.metal-ized metal complex or a porphyrin metal complex [0056] The compound used still more preferably also in said compound is as follows. ; poly thiophenes, such as various metal complexes represented by; eight quinolinol, and the metal complexes and rare earth complexes of the derivative, such as styryl benzene, polyphenyl, a diphenyl butadiene, a tetra-phenyl butadiene, a coumarin, perylene, OKISA diazole, a bis-styryl anthracene, a styryl amine, an aromatic dimethyldiyne compound, pyrenes, and these derivatives, polyphenylene, the poly fluorene, polyphenylene vinylenes, these permuted polymer compounds; ;, such as an alt.metal-ized metal complex or a porphyrin metal complex [0057] Although especially the thickness of an organic compound layer is not limited, usually the thing of the range of 1nm - 5 micrometers is desirable, and is 5nm - 1 micrometer more preferably, and it is 10nm - 500nm still more preferably.

[0058] although especially the formation approach of an organic compound layer is not what is limited -- resistance heating vacuum evaporatio, an electron beam, sputtering, a molecule laminated layers method, coating methods (a spin coat method, the cast method, dip coating method, etc.), the ink jet method, print processes, a replica method, and LB (Langmuir-BUROIETTO) -- approaches, such as law, are used and they are resistance heating vacuum evaporatio, a coating method, the ink jet method, and print processes preferably. In the case of a coating method, the ink jet method, and print processes, it can dissolve or distribute with a resinous principle. As a resinous principle for example A polyvinyl chloride, a polycarbonate, polystyrene, polymethylmethacrylate, Poly butyl methacrylate, polyester, polysulfone, polyphenylene oxide, Polybutadiene, Pori (N-vinylcarbazole), hydrocarbon resin, Ketone resin, phenoxy resin, a polyamide, ethyl cellulose, vinyl acetate, ABS plastics, polyurethane, melamine resin, an unsaturated polyester resin, alkyd resin, an epoxy resin, silicon resin, etc. are mentioned.

[0059] A low molecular weight compound may be used for hole impregnation nature and a hole transportability compound that what is necessary is just any of the function to pour in a hole from an anode plate, the function to convey a hole, and the function that carries out the obstruction of the electron poured in from cathode, or the thing which it has, using a polymer. As the example, a carbazole, triazole, oxazole, OKISA diazole, an imidazole, the poly aryl alkane, pyrazoline, A pyrazolone, a phenylenediamine, arylamine, an amino permutation chalcone, a styryl anthracene and full -- me -- non, a hydrazone, a stilbene, and a silazane -- And these derivatives, an aromatic series

tertiary-amine compound, a styryl amine compound, An aromatic series JIMECHIRI DIN system compound, a porphyrin system compound, a polysilane system compound, Conductive polymer oligomer, such as the Pori (N-vinylcarbazole) derivative, an aniline system copolymer, a thiophene compound, the poly thiophene, a permutation, and non-permuted poly thiophene-polystyrene sulfonate mixture, etc. may be mentioned, and you may be such mixture. especially -- a carbazole, triazole, oxazole, OKISA diazole, an imidazole, a phenylenediamine, arylamine, and full -- me -- non, conductive polymer oligomer, such as a stilbene, silazanes and these derivatives, an aromatic series tertiary-amine compound, a styryl amine compound, an aromatic series JIMECHIRI DIN system compound, an aniline system copolymer, a thiophene compound, the poly thiophene, a permutation, and non-permuted poly thiophene-polystyrene sulfonate mixture, etc. is more desirable. the inside of this -- the point of a hole transportation function -- a carbazole, triazole, oxazole, OKISA diazole, an imidazole, a phenylenediamine, arylamine, and full -- me -- non, conductive polymer oligomer, such as silazanes and these derivatives, an aromatic series tertiary-amine compound, a thiophene compound, a permutation, and non-permuted poly thiophene-polystyrene sulfonate mixture, etc. is still more desirable.

[0060] What is necessary is just to have the ingredient of an electron injectional compound, an electronic transportability compound, and a transportability [electron injection nature-cum-] compound in any of the function to pour in an electron from cathode, the function to convey an electron, and the function that carries out the obstruction of the hole poured in from the anode plate. As an example, a pyridine, pyrazine, a quinoline, quinoxaline, phenan SURORIN, Triazine, thieno pyrazine, benzimidazole benzoxazole, Benzotriazol, phenanthridine, triazole, oxazole, OKISA diazole and full -- me -- non and anthra quinodimethan and an anthrone -- A diphenyl quinone, thiopyran dioxide, Calvi diimide, full ORENIRIDEN methane, Heterocycle tetracarboxylic acid anhydrides, such as JISUCHIRIRU pyrazine, phthalocyanines and these derivatives, and naphthalene perylene, The various metal complexes which make a ligand the metal complex, a metal phthalocyanine and benzooxazole, and benzothiazole of an eight-quinolinol derivative are mentioned. You may use it as mixture or a polymer. especially -- a pyridine, pyrazine, a quinoline, quinoxaline, phenan SURORIN, triazine, phenanthridine, triazole, oxazole, OKISA diazole, and full -- me -- non, these polymers, such as various metal complexes which make a ligand the metal complex of heterocycle tetracarboxylic acid anhydrides, such as phthalocyanines and these derivatives, and naphthalene perylene, and an eight-quinolinol derivative, a metal phthalocyanine and benzooxazole, and benzothiazole, are more desirable. the inside of this -- a pyridine, pyrazine, a quinoline, quinoxaline, phenan SURORIN, triazine, triazole, oxazole, OKISA diazole, and full -- me -- non, the metal complex, the metal phthalocyanines, and these polymers of phthalocyanines and these derivatives, and an eight-quinolinol derivative are still more desirable.

[0061] Although the arylamine contained in the organic compound layer in this invention and its derivative usually act as hole impregnation nature and a hole transportability compound, and host compounds, if it becomes a macromolecule, acting also as an electronic transportability compound is known. A thoria reel amine and its derivative, N-phenyl carbazole, and its derivative of arylamine and its derivative are specifically desirable, and N-phenyl carbazole and its derivative are used more preferably especially. These may be low molecular weight compounds, or may be high molecular compounds.

[0062] What is necessary is just to have the function to prevent that what promotes component degradation of moisture, oxygen, etc. invades into a component as an ingredient of a protective layer. As the example, In, Sn, Pb, Au, Cu, Ag, aluminum, Metals, such as Ti and nickel, MgO, SiO and SiO₂, aluminum₂O₃, GeO, NiO, CaO, BaO, Fe₂O₃, Y₂O₃, the metallic oxide of TiO₂ grade, MgF₂, LiF, AlF₃, and CaF₂ etc. -- a metal fluoride and polyethylene -- Polypropylene, polymethylmethacrylate, polyimide, poly urea, Polytetrafluoroethylene, polychlorotrifluoroethylene resin, poly dichlorodifluoroethene, The copolymer of chlorotrifluoroethylene and dichlorodifluoroethene, The copolymer which is made to carry out copolymerization of the monomer mixture containing tetrafluoroethylene and at least one sort of comonomers, and is obtained, the fluorine-containing copolymer which has cyclic structure in a copolymerization principal chain, the absorptivity matter of 1% or more of water absorption, the dampproof matter of 0.1% or less of water absorption, etc. are mentioned.

[0063] the formation approach of a protective layer -- especially -- limitation -- there is nothing -- for example, chemical vapor deposition (CVD method), a vacuum deposition method, the sputtering method, a reactive sputtering method, and molecular beam epitaxy (MBE) -- law, the ionized cluster beam method, the ion plating method, a plasma polymerization method (the high-frequency excitation ion plating method), a plasma-CVD method, a laser CVD method, a heat CVD method, a gas source CVD method, the ink jet method, print processes, a coating method, and a

replica method are applicable.

[0064]

[Example] Although an example is given to below and this invention is concretely explained to it, thereby, this invention is not limited. In addition, the following measurement was performed in the following example. Using gel filtration technique, weight average molecular weight makes a tetrahydrofuran an eluate, and carries out polystyrene conversion. Ionization potential was measured by ultraviolet-rays photoelectron analysis apparatus AC-1. Absorption of a solution is a thing at the time of the concentration of 1×10^{-7} mol/l among chloroform. an energy gap -- the long wave of solution absorption -- the wave number of an edge was converted into energy and it asked for it. The electron affinity put and calculated the value of an energy gap from the value of ionization potential. Membranous luminescence maximum wave length used to measure it, when the film which carried out spin coat spreading and was obtained by carrying out a vacuum drying on the conditions for 5000rpm x 20 seconds on the glass substrate in the solution which melted polymer 20mg to chloroform 2ml is excited with 255nm light. Glass-transition temperature was measured by the usual approach using DSC.

Example 1 (composition of the instantiation compound 1)

Under the nitrogen air current, 2, 7-screw (4, 4, 5, and 5-tetramethyl - 1, 3, 2-JIOKI slowdown loran-2-IRU) -9, 9-G normal octyl fluorenesg [1.6064] (2.50mmol) and 1, 4-dibromo -2, and 5-dimethoxybenzene 0.7399g (2.50mmol), toluene 1ml, and TORIKA prill ylmethyl ammoniumchloride 0.125g (0.31mmol) were put in, and it stirred at the room temperature for 10 minutes. Subsequently, tetrakis (triphenylphosphine) palladium 0.015g (0.0125mmol:0.25-mol%) was added, and it stirred at the room temperature for 10 minutes. Subsequently, 4.17ml of 2M sodium-carbonate water solutions was added, and it stirred strongly for 2 hours, flowing back gently. Subsequently, toluene 4.17ml was added, and it stirred for further 15 hours, flowing back. Subsequently, it stirred for further 9 hours, having added toluene 5ml and flowing back. Subsequently, it is 2-phenyl as an end processing agent. - 1, 3, and 2-dioxa BORINAN 0.1825g (1.125mmol) was added, it stirred flowing back for 15 hours, and subsequently bromobenzene 0.083g (0.53mmol) was added, and it stirred, flowing back for 5 hours. After reaction termination and after adding and diluting toluene 20ml, the reaction mixture was cooled to the room temperature, and reprecipitation purification was dropped and carried out, stirring in the solution of methanol:water =10:1 (volume ratio). After filtering and collecting the obtained polymers, a methanol and water washed several times. Subsequently, the vacuum drying was carried out at the room temperature, and the polymer of the instantiation compound 1 was obtained. Weight-average-molecular-weight (Mw) 8000 (polystyrene conversion), number-average-molecular-weight (Mn) 5000 (polystyrene conversion), ionization potential (IP)5.85eV, 2.81eV [of electron affinities], and energy gap 3.04eV, the luminescence maximum wave length of 414nm of a solution, the absorption-maximum wavelength of 358nm (inside of chloroform, 1×10^{-7} mol/l.), 420nm of membranous luminescence maximum wave length, membranous absorption-maximum wavelength of 365nm, glass-transition temperature of 172 degrees C.

[0065] Example 2 (composition of the instantiation compound 2)

Except having replaced 1 of an example 1, 4-dibromo -2, and 5-dimethoxybenzene with 2 and 6-dibromo pyridine, a polymerization and purification were performed like the example 1 and the polymer of the instantiation compound 2 was obtained. Weight-average-molecular-weight (Mw) 34000, number-average-molecular-weight (Mn) 14000, ionization potential (IP)5.90eV, 2.70eV [of electron affinities], and energy gap 3.20eV, the luminescence maximum wave length of 383nm of a solution, the absorption-maximum wavelength of 368nm, the half-value width of 32nm (inside of chloroform, 1×10^{-7} mol/l), 408nm of membranous luminescence maximum wave length, absorption-maximum wavelength of 370nm, glass-transition temperature of 112 degrees C.

[0066] Example 3 (composition of the instantiation compound 3)

Except having replaced 1 of an example 1, 4-dibromo -2, and 5-dimethoxybenzene with 2 and 5-dibromo pyridine, a polymerization and purification were performed like the example 1 and the polymer of the instantiation compound 3 was obtained. Weight-average-molecular-weight (Mw) 100000, number-average-molecular-weight (Mn) 35000, ionization potential (IP)5.87eV, 2.99eV [of electron affinities], and energy gap 2.88eV, the luminescence maximum wave length of 418nm of a solution, the absorption-maximum wavelength of 386nm, the half-value width of 40nm (inside of chloroform, 1×10^{-7} mol/l), membranous luminescence maximum wave length of 429nm, absorption-maximum wavelength of 388nm.

[0067] Example 4 (composition of the instantiation compound 4)

Except having replaced 1 of an example 1, 4-dibromo -2, and 5-dimethoxybenzene with 1 and 4-dibromo tetrafluoro benzene, a polymerization and purification were performed like the example 1 and the polymer of the instantiation compound 4 was obtained. Weight-average-molecular-weight (Mw) 24000, number-average-molecular-weight (Mn) 10000, ionization potential (IP) 5.62eV, 2.40eV [of electron affinities], and energy gap 3.22eV, the luminescence maximum wave length of 400nm of a solution, the absorption-maximum wavelength of 341nm, the half-value width of 63nm (inside of chloroform, 1×10^{-7} mol/l), 408nm of membranous luminescence maximum wave length, absorption-maximum wavelength of 347nm, glass-transition temperature of 58 degrees C.

[0068] Example 5 (composition of the instantiation compound 5)

It is 2 and 5-screw (4-BUOMO phenyl) about 1 of an example 1, 4-dibromo -2, and 5-dimethoxybenzene. - Except having replaced with 1, 3, and 4-OKISA diazole, a polymerization and purification were performed like the example 1 and the polymer of the instantiation compound 5 was obtained. Weight-average-molecular-weight (Mw) 153000, number-average-molecular-weight (Mn) 47000, ionization potential (IP) 5.86eV, 2.86eV [of electron affinities], and energy gap 3.00eV, the luminescence maximum wave length of 410nm of a solution, the absorption-maximum wavelength of 376nm, (the inside of chloroform and 1×10^{-7} mol/l), 446nm of membranous luminescence maximum wave length, absorption-maximum wavelength of 369nm, glass-transition temperature of 51 degrees C.

[0069] Example 6 (composition of the instantiation compound 7)

Except having replaced 1 of an example 1, 4-dibromo -2, and 5-dimethoxybenzene with 2 and 5-dibromo pyrazine, a polymerization and purification were performed like the example 1 and the polymer of the instantiation compound 7 was obtained. Weight-average-molecular-weight (Mw) 25000, number-average-molecular-weight (Mn) 12000, ionization potential (IP) 5.92eV, 3.19eV [of electron affinities], and energy gap 2.73eV, the luminescence maximum wave length of 443nm of a solution, the absorption-maximum wavelength of 420nm, (the inside of chloroform and 1×10^{-7} mol/l), 450nm of membranous luminescence maximum wave length, absorption-maximum wavelength of 428nm, glass-transition temperature of 75 degrees C.

[0070] Example 7 (composition of the instantiation compound 8)

Except having replaced 1 of an example 1, 4-dibromo -2, and 5-dimethoxybenzene with 1 and 3-dibromo benzene, a polymerization and purification were performed like the example 1 and the polymer of the instantiation compound 8 was obtained. Weight-average-molecular-weight (Mw) 15000, number-average-molecular-weight (Mn) 8000, ionization potential (IP) 5.62eV, 2.26eV [of electron affinities], and energy gap 3.36eV, the luminescence maximum wave length of 367nm of a solution, the absorption-maximum wavelength of 343nm, (the inside of chloroform and 1×10^{-7} mol/l), 418nm of membranous luminescence maximum wave length, absorption-maximum wavelength of 344nm, glass-transition temperature of 70 degrees C.

[0071] On the ITO substrate washed example 8, it is Baytron. After carrying out the spin coat of the P (a PEDOT/PSS solution (Pori (3 4) ethylene dioxythiophene-polystyrene sulfonate dope object) / Bayer make) in 1000rpm and 30 seconds, the vacuum drying was carried out at 150 degrees C for 1.5 hours, and hole impregnation / transportability film was created (about 100nm of thickness). The spin coat (1000rpm, 20 seconds) of the solution which besides melted 5= 8mg [of compound 2:instantiation compounds for a compound 1:trial for a trial] : 30.4mg : 1.6mg mixture to xylene 4ml was carried out (about 50nm of thickness). Subsequently, after installing the mask (mask with which luminescence area is set to 5mmx5mm) which carried out patterning on this organic thin film and vapor-depositing calcium by 250nm of thickness within vacuum evaporatio equipment, aluminum was vapor-deposited by 300nm of thickness (1.0×10^{-3} Pa to 1.3×10^{-3} Pa), and the light emitting device was created.

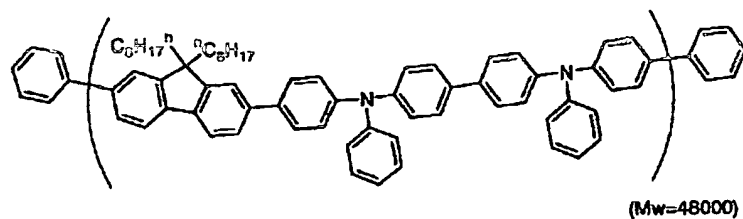
[0072] The luminescence property was measured as follows. using TOYO source major unit 2400 mold, a direct-current constant voltage is impressed to a light emitting device by using calcium:aluminum as cathode, using ITO as an anode plate, and light is emitted -- making -- brightness -- luminance-meter BM-8 of TOPCON CORP., and luminescence wavelength -- the Hamamatsu photonics company make -- it measured using spectrum analyzer PMA-11. Moreover, in order to evaluate the endurance at the time of elevated-temperature preservation, the produced component was made to emit light after 3-hour neglect under the conditions of 60 degrees C and 20% relative humidity, and relative luminance (it displays by driver voltage 10V, setting the brightness immediately after component production to 100, and using after [the passage of time of] brightness as a relative value) was measured. The measurement result is as follows. The minimum driver voltage (the minimum electrical potential difference by which luminescence is observed) was 3V, showed the current density of 1145 mA/cm² in 10V, and showed dark blue luminescence with very

sufficient color purity by the brightness of 2290 cd/m². Maximum luminescence wavelength λ_{max} (es) were 435nm, the half-value width of 42nm, a chromaticity coordinate (0.159 0.104), and 0.21% of external quantum efficiency. The relative luminance after the passage of time was 85.

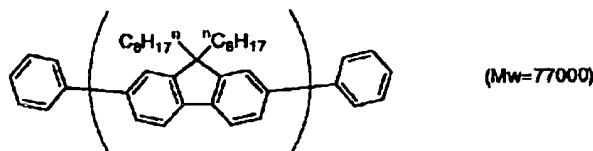
[0073]

[Formula 11]

試験化合物1.



試験化合物2.



[0074] The component was created like the example 8 except having replaced the instantiation compound 5 of example 9 example 8 with the instantiation compound 4. The luminescence property was measured like the example 8. The measurement result is as follows. The minimum driver voltage (the minimum electrical potential difference by which luminescence is observed) was 3V, showed the current density of 1605 mA/cm² in 13V, and showed dark blue luminescence with very sufficient color purity by the brightness of 1762 cd/m². Maximum luminescence wavelength λ_{max} (es) were 434nm, the half-value width of 49nm, a chromaticity coordinate (0.154 0.069), and 0.19% of external quantum efficiency. The relative luminance after the passage of time was 87.

[0075] The component was created like the example 8 except having replaced the instantiation compound 5 of example 10 example 8 with the instantiation compound 1. The luminescence property was measured like the example 8. The measurement result is as follows. The minimum driver voltage (the minimum electrical potential difference by which luminescence is observed) was 3V, showed the current density of 2085 mA/cm² in 11V, and showed dark blue luminescence with very sufficient color purity by the brightness of 2560 cd/m². Maximum luminescence wavelength λ_{max} (es) were 434nm, the half-value width of 43nm, a chromaticity coordinate (0.155 0.062), and 0.33% of external quantum efficiency. The relative luminance after the passage of time was 89.

[0076] The component was created like the example 8 except having replaced the instantiation compound 5 of example of comparison 1 example 8 with the trial compound 2 of a well-known compound. The luminescence property was measured like the example 8. The measurement result is as follows. The minimum driver voltage (the minimum electrical potential difference by which luminescence is observed) was 5V, and it did not pass over it for the current density of 65 mA/cm² to have been shown in 10V, but it showed the brightness of 97 cd/m². Moreover, the luminescent color was a light blue - bluish green color. Maximum luminescence wavelength λ_{max} showed 422nm, 483nm, and with a half-value width [of 125nm] luminescence, and has changed from the luminescence property in a solution a lot (the luminescence maximum wave length in a solution being about 416nm, and half-value width being about 40nm). a chromaticity coordinate -- very much -- color purity -- having fallen (0.178 0.264) -- it was shown. External quantum efficiency was only 0.01% (it measures by 10V and 97 cd/m²). The relative luminance after the passage of time was 65.

[0077]

[Effect of the Invention] It became clear that high brightness is shown, the excimer formation by the interaction between polymer principal chains is checked, and the component of good color purity can be created by using the compound of this invention from the above-mentioned result. Furthermore, the brightness fall after elevated-temperature storage can offer the component which was small excellent in endurance. Moreover, creation of the

laminating mold component by the spreading process can be realized, and it is useful practically.

[Translation done.]